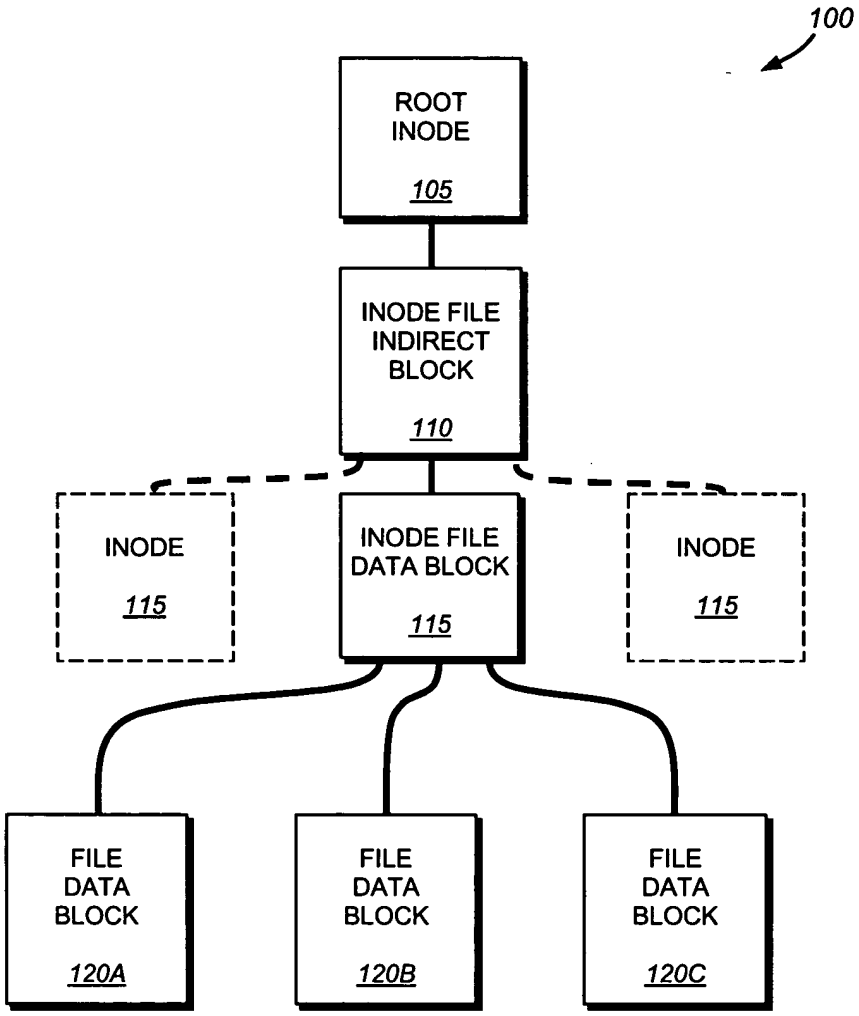

FIG. 1
(PRIOR ART)

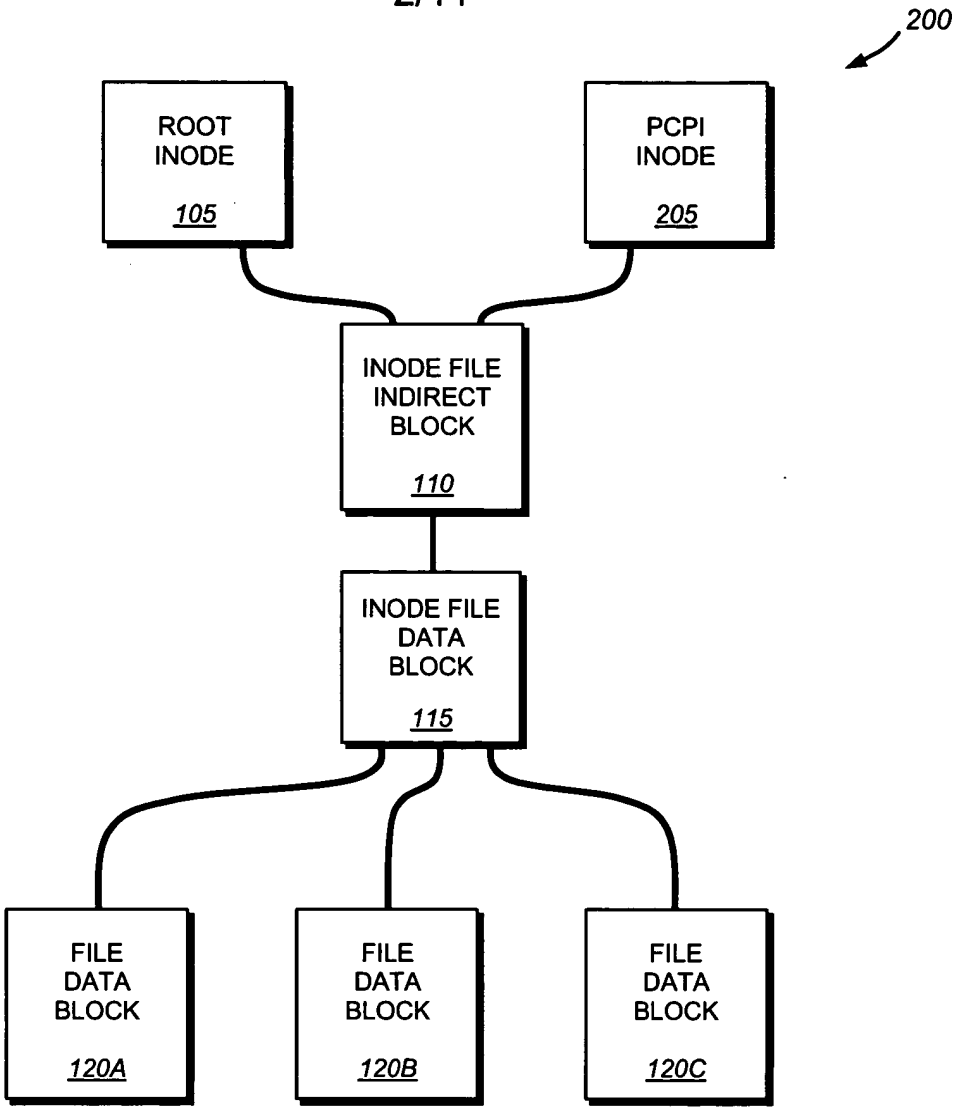

FIG. 2
(PRIOR ART)

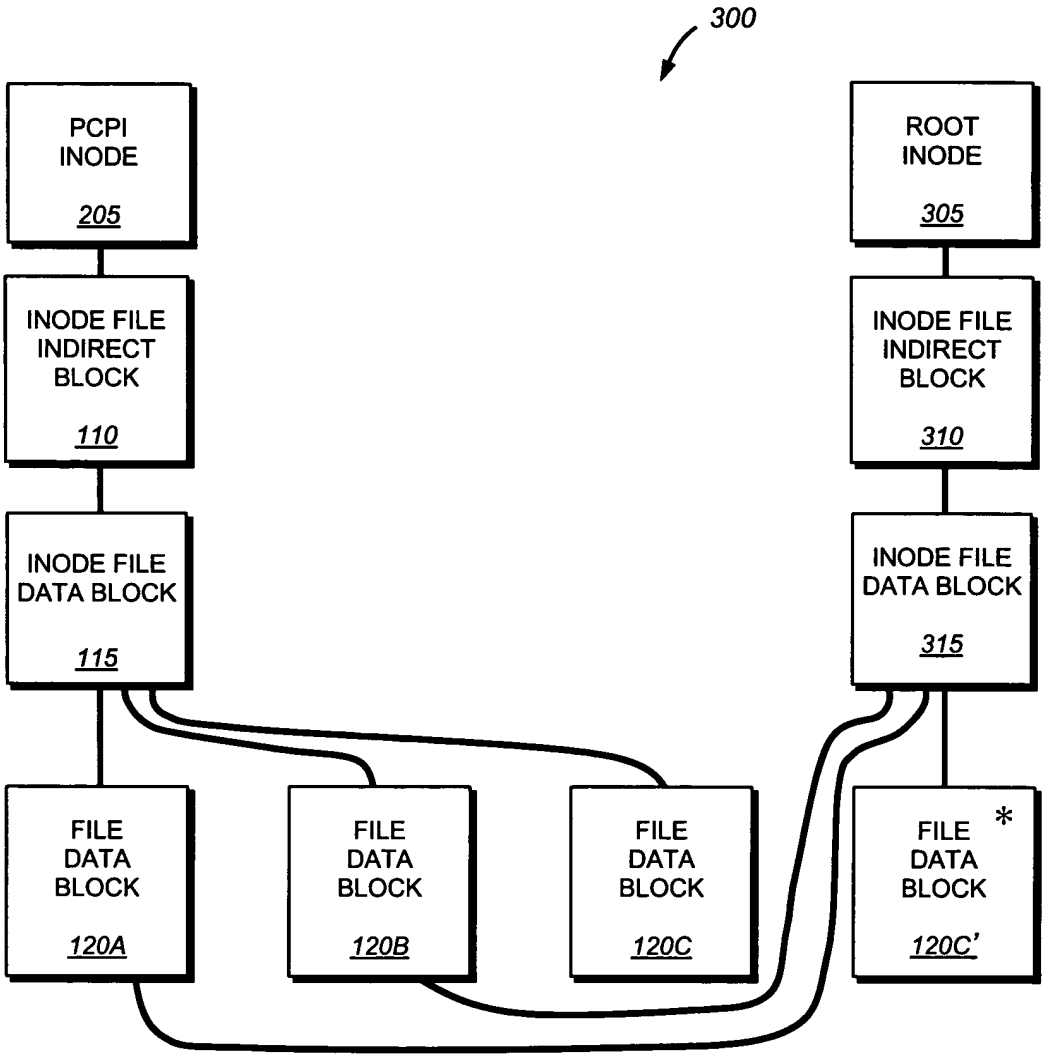

FIG. 3
(PRIOR ART)

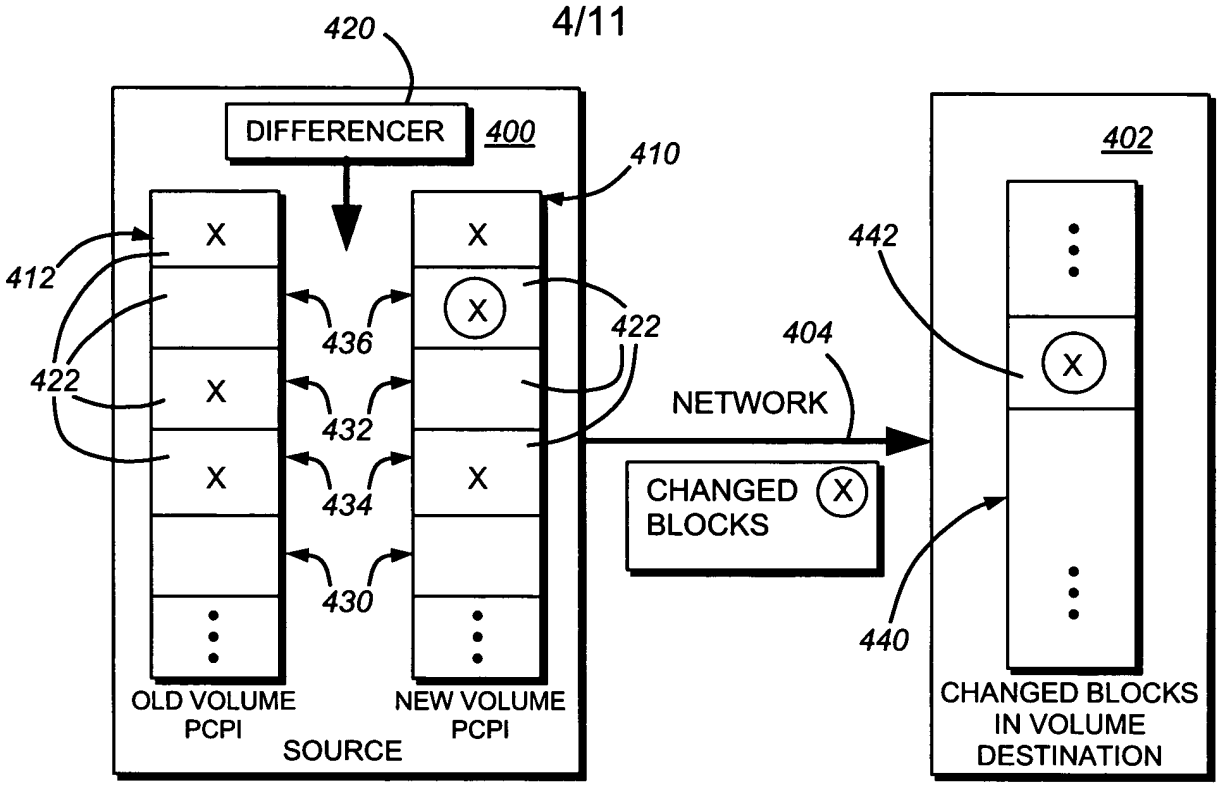

FIG. 4
(PRIOR ART)

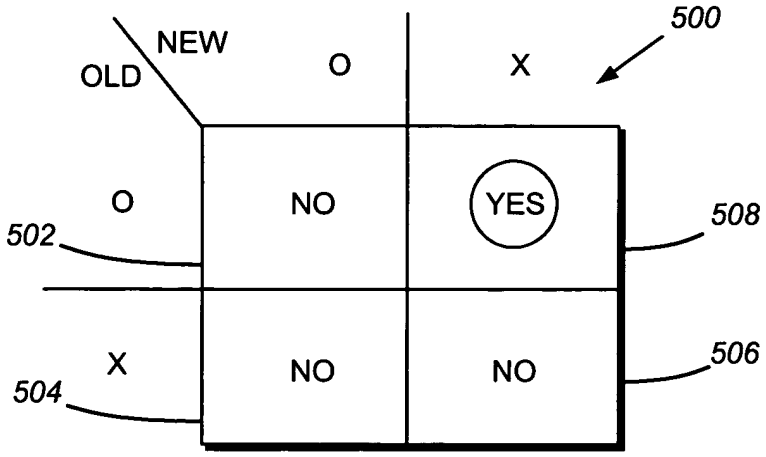

FIG. 5
(PRIOR ART)

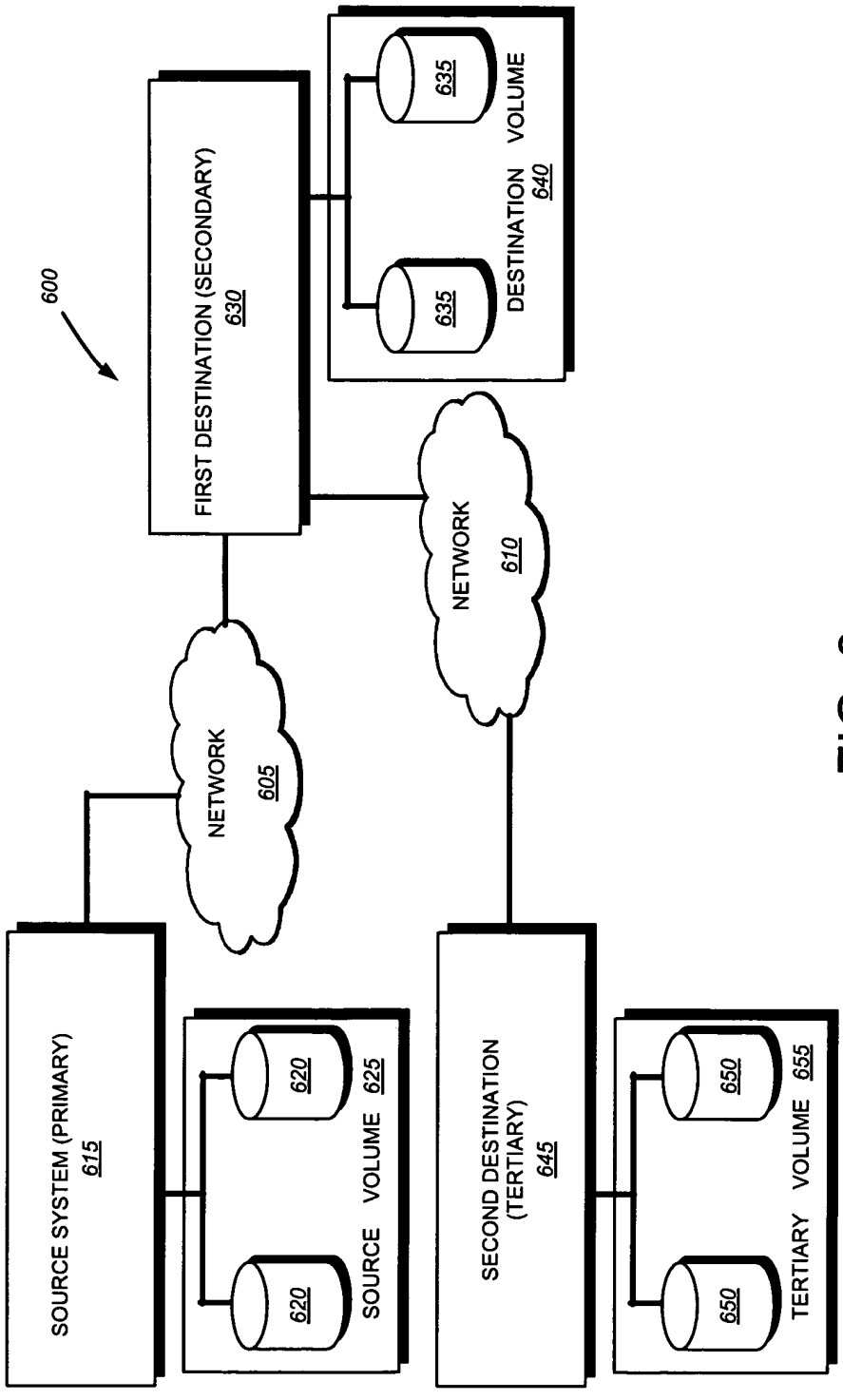
600
SOURCE SYSTEM (PRIMARY)
615
620
620
SOURCE VOLUME 625
NETWORK
605
FIRST DESTINATION (SECONDARY)
630
635
635
DESTINATION VOLUME
640
NETWORK
610
SECOND DESTINATION
(TERTIARY)
645
650
650
TERTIARY VOLUME 655

FIG. 6

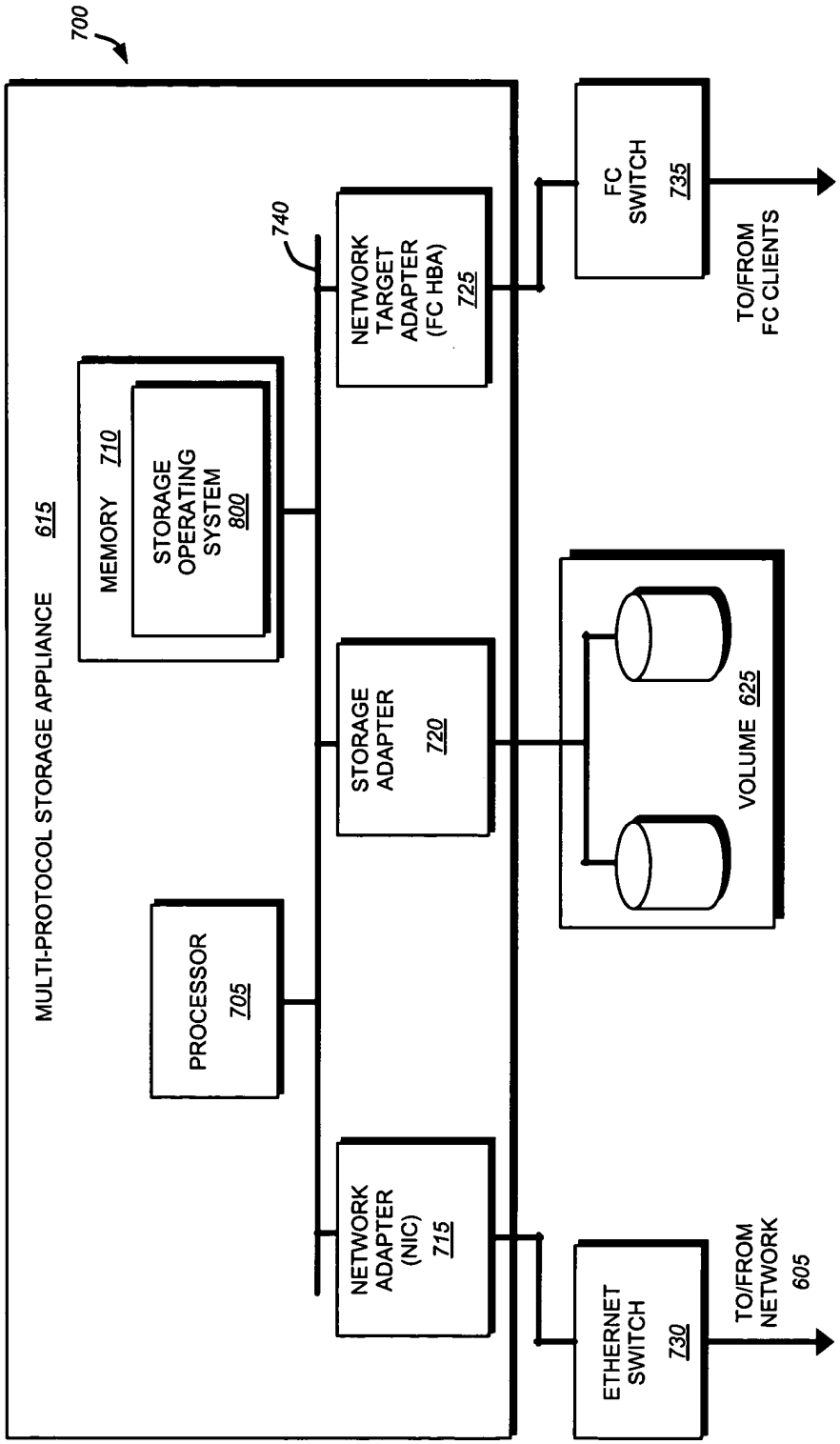
700
MULTI-PROTOCOL STORAGE APPLIANCE 615
MEMORY 710
STORAGE OPERATING SYSTEM 800
PROCESSOR 705
NETWORK ADAPTER (NIC) 715
STORAGE ADAPTER 720
NETWORK TARGET ADAPTER (FC HBA) 725
740
FC SWITCH 735
TO/FROM FC CLIENTS
VOLUME 625
ETHERNET SWITCH 730
TO/FROM NETWORK 605

FIG. 7

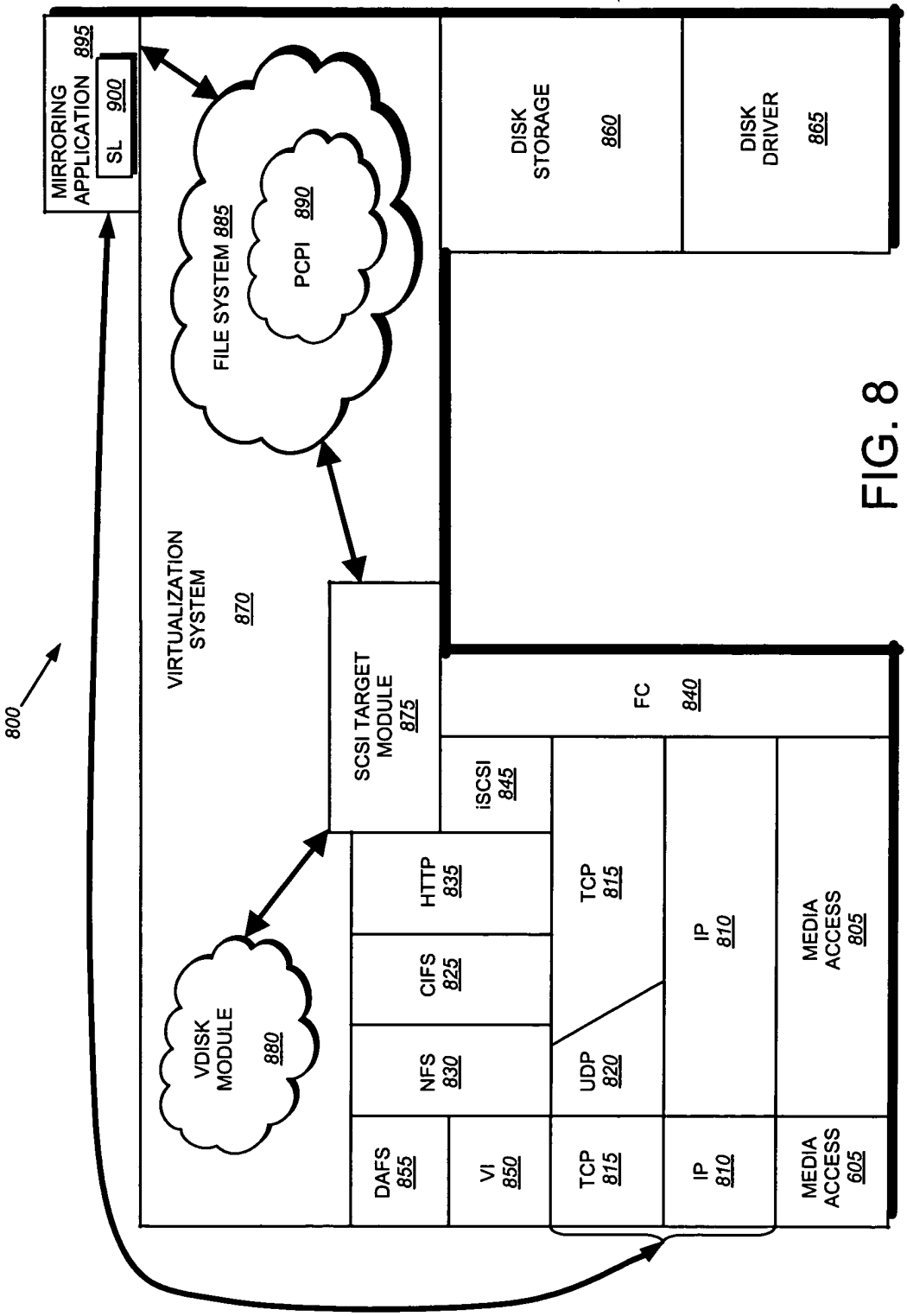
800
MIRRORING APPLICATION 895
SL 900
VIRTUALIZATION SYSTEM 870
FILE SYSTEM 885
PCPI 890
VDISK MODULE 880
SCSI TARGET MODULE 875
DISK STORAGE 860
DISK DRIVER 865
FC 840
iSCSI 845
HTTP 835
CIFS 825
NFS 830
DAFS 855
VI 850
TCP 815
UDP 820
IP 810
MEDIA ACCESS 805
TCP 815
IP 810
MEDIA ACCESS 605

FIG. 8

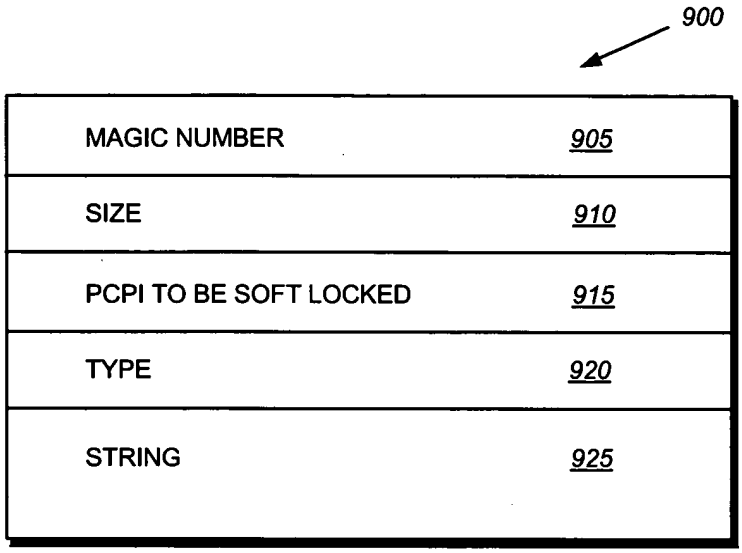
900
MAGIC NUMBER
905
SIZE
910
PCPI TO BE SOFT LOCKED
915
TYPE
920
STRING
925

FIG. 9

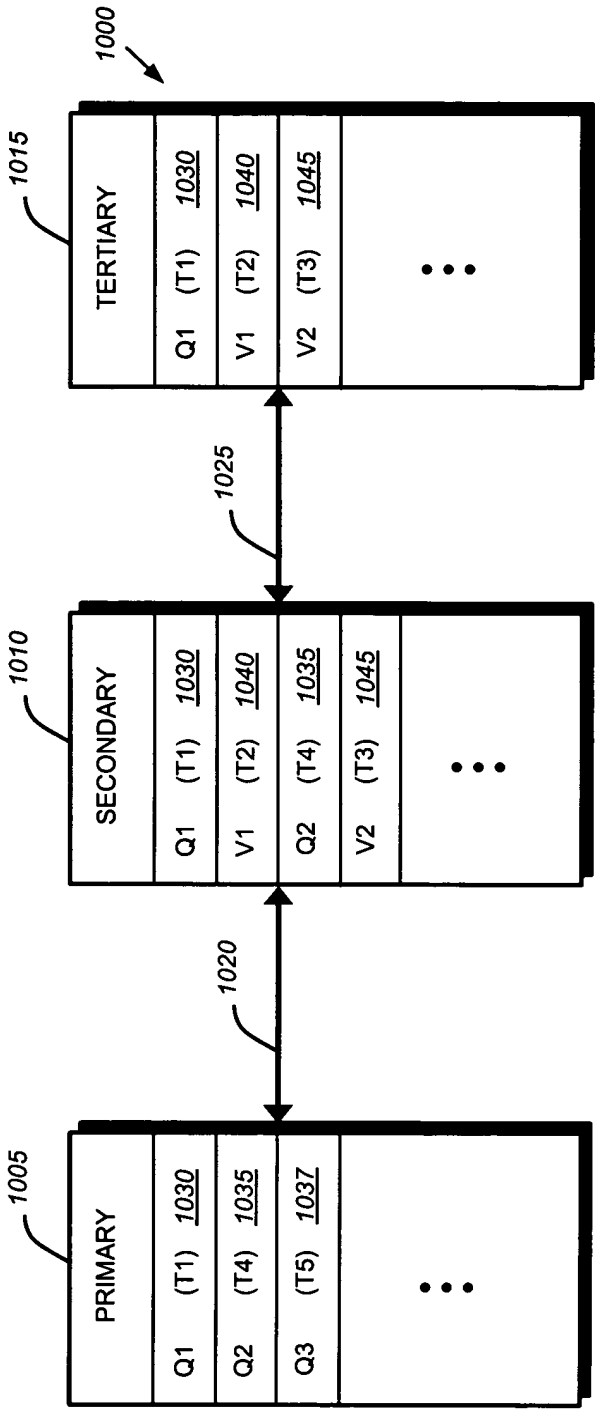
1000
1015
TERTIARY
Q1 (T1) 1030
V1 (T2) 1040
V2 (T3) 1045
1025
1010
SECONDARY
Q1 (T1) 1030
V1 (T2) 1040
Q2 (T4) 1035
V2 (T3) 1045
1020
1005
PRIMARY
Q1 (T1) 1030
Q2 (T4) 1035
Q3 (T5) 1037

FIG. 10

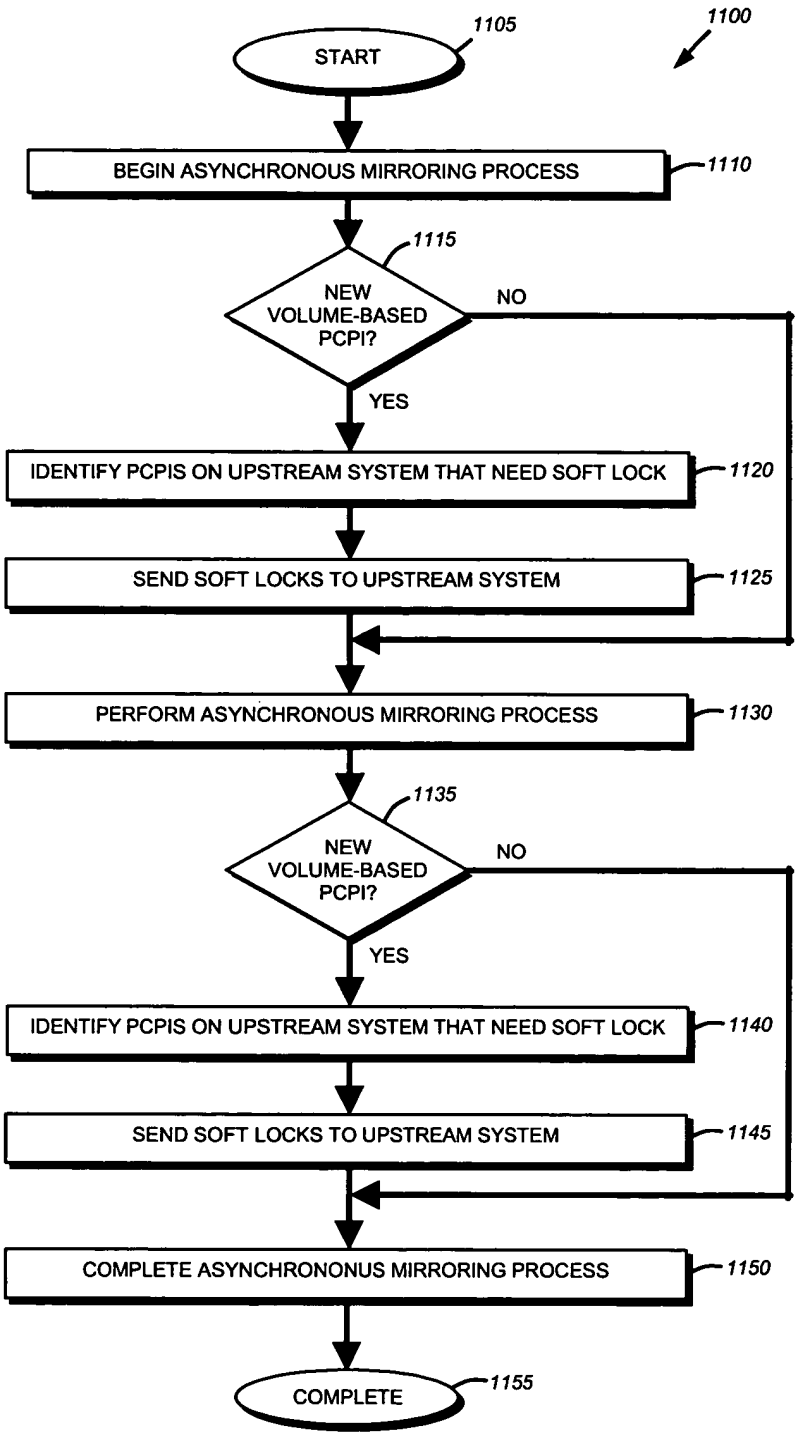
1100
1105
START
BEGIN ASYNCHRONOUS MIRRORING PROCESS
1110
1115
NEW VOLUME-BASED PCPI?
NO
YES
IDENTIFY PCPIS ON UPSTREAM SYSTEM THAT NEED SOFT LOCK
1120
SEND SOFT LOCKS TO UPSTREAM SYSTEM
1125
PERFORM ASYNCHRONOUS MIRRORING PROCESS
1130
1135
NEW VOLUME-BASED PCPI?
NO
YES
IDENTIFY PCPIS ON UPSTREAM SYSTEM THAT NEED SOFT LOCK
1140
SEND SOFT LOCKS TO UPSTREAM SYSTEM
1145
COMPLETE ASYNCHRONONUS MIRRORING PROCESS
1150
COMPLETE
1155

FIG. 11

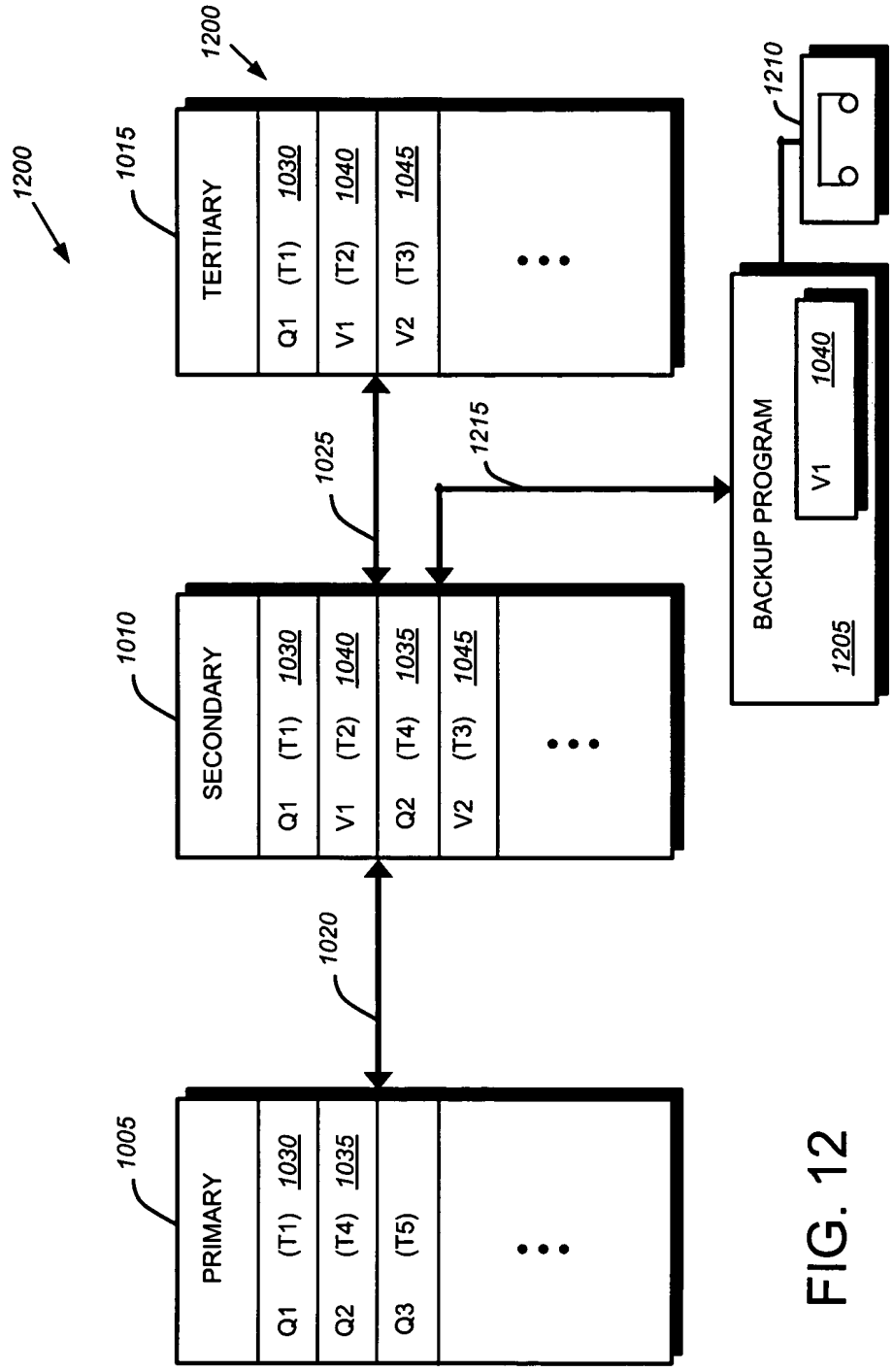
1200
1200
1015
TERTIARY
Q1 (T1) 1030
V1 (T2) 1040
V2 (T3) 1045
1210
1025
1215
BACKUP PROGRAM
V1 1040
1205
1010
SECONDARY
Q1 (T1) 1030
V1 (T2) 1040
Q2 (T4) 1035
V2 (T3) 1045
1020
1005
PRIMARY
Q1 (T1) 1030
Q2 (T4) 1035
Q3 (T5)

FIG. 12